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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/511,811	10/19/2004	Alexandr Nikolaevich Zajcev	RU 020001	6555

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BRIARCLIFF MANOR, NY 10510

EXAMINER

YAKULIS, JEFFREY C

ART UNIT	PAPER NUMBER
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1753

MAIL DATE	DELIVERY MODE
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09/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/511,811

Applicant(s)

ZAJCEV ET AL.

Examiner

Jeff Yakulis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2004.
- * 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/31/2005
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 1, 10, and 13-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Taylor (6,558,231) and Zhou et al. (6,403,931 as incorporated by reference therein (Taylor col. 2 line 62).

Regarding claim 1, Taylor teaches electropolishing of a metal surface using a pulsed current where the pulsed current/voltage comprising an anodic pulse (unipolar pulse) followed by a cathodic pulse (inverse of the unipolar pulse, Zhou et al. col. 4 line 62 – col. 5 line 19) while maintaining a gap between a workpiece and an opposing electrode (col. 2 lines 59-67, Zhou et al. col. 11 line 45-49), and further teaches a two step machining process where initial pulse duration and amplitude differs from the second such that it can more effectively machine different size asperities on the workpiece by initially setting the conditions to machine larger asperities (shown in figure 4A macroasperities [404] and microasperities [406]) and then adjusting then adjusting the pulse duration and amplitude to machine microasperities [406] most effectively with corresponding waveform profiles shown in figures 2 (corresponding to the initial

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machining of macroasperities [404], col. 5 line 25 – col. 6 line 13) and 3 (corresponding to the machining of microasperities [406], col. 6 lines 18-62).

Regarding claim 10, Taylor teaches electropolishing of a metal surface using a pulsed current where the pulsed current/voltage comprises an anodic pulse (unipolar pulse) followed by a cathodic pulse (inverse of the unipolar pulse, Zhou et al. col. 4 line 62 – col. 5 line 19) while maintaining a gap between a workpiece and an opposing electrode (col. 2 lines 59-67, Zhou et al. col. 11 line 45-49), and further teaches a two step machining process where the initial pulse duration and amplitude differs from the second such that it can more effectively machine different size asperities on the workpiece by initially setting the conditions to machine larger asperities (shown in figure 4A macroasperities [404] and microasperities [406]) and then adjusting then adjusting the pulse duration and amplitude to machine microasperities [406] most effectively with corresponding waveform profiles shown in figures 2 (corresponding to the initial machining of macroasperities [404], col. 5 line 25 – col. 6 line 13) and 3 (corresponding to the machining of microasperities [406], col. 6 lines 18-62); an operational parameter is set for the height of the macroasperities to be less than about 100 micrometers and the workpiece is eroded via anodic pulses (inverse polarity) until an optimal height of the macroasperities has been taken below the target height (col. 4 line 51 – col. 5 line 37).

Regarding claim 13, Taylor teaches a means for measuring a height of asperities on a workpiece (operational parameter) of a workpiece (col. 4 line 51 – col. 5 line 24), a calibration means is applied to test samples prior to machining to resolve the optimum pulse waveform parameters (Zhou et al. col. 13 lines 31-53) this calibration is done with

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respect to measured surface conditions (rough, dull, smooth, shiny), which corresponds to the height of asperities on the workpiece (rough having large asperities and shiny having very small asperities, Zhou et al. col. 11 lines 33-67), the optimal anodic duty cycle and frequency data is stored (figures 4-7) and is related to the surface condition (rough, dull, shiny, smooth) of the machined test sample, which corresponds to the height of asperities across the workpiece (Zhou et al. col. 13 lines 14-54), asperity heights (operational parameter) are monitored and measured until they reach about 100 micrometers (col. 5 lines 25-37) and compared between the actual asperity height and a predetermined stop point for the asperity heights (less than 100 micrometers) an optimal anodic pulse waveform (inverse polarity) is chosen and applied from a set of stored pulse conditions based on the machining needs (duty cycles no greater than 50%, pulse train on/off times 10 microseconds to 500 milliseconds, pulse widths of 0.1 microseconds to 100 milliseconds) until the predetermined operational parameter is met (asperity height) (col. 5 line 25 – col. 5 line 13).

Regarding claim 14, Taylor teaches electrochemical machining of a workpiece (col. 2 lines 45-67) and teaches all the elements of the control system mentioned in claim 13.

Regarding claim 15, Taylor teaches the control system of claim 13 and teaches storing data while calibrating the optimal pulse duration, frequency, and amplitude of a workpiece (Zhou et al. col. 13 lines 14-48) using a program store on a computer to control the system is inherent.

Claim Rejections - 35 USC § 103

3. Claims 2-9 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor (6,558,231) as applied to claim 1 above, and further in view of Gimaev et al. (5,833,835).

Regarding claim 2, 11, and 12, Taylor teaches applying anodic pulses (inverse polarity) having a range of amplitudes and duration in order to remove depositions on a workpiece (col. 5 line 38 – col. 6 line 13) and experimentally determining the removal rate so as to calibrate an optimal pulse duration, frequency, and amplitude by using a clean metallic sample and measuring a depth of the depression of the machined test sample (example 1) but fails to disclose calibrating the pulse durations by depositing a material on a clean metal sample and storing those deposition heights in order to find a suitable pulse having the inverse polarity to remove the deposited material.

Gimaev et al. teaches electrochemically machining a conductive workpiece using bipolar electrical pulses (abstract). Gimaev et al. teaches finding an optimum amplitude of a pulse current by applying a series of increasing cathodic voltage (cathodic operation parameter) pulses of increasing intensity allowing for deposition of a metal (cathode depositions selected as a variable) measured, which is representative of a property of a gap between an electrode and workpiece these cathodic amplitudes are proportional to voltages of an opposite polarity (inverse polarity) representative of a machining rate (col. 1 line 62 – col. 2 line 30). Gimaev et al. further teaches that by using a prior test to determine the optimum limits it allows for high machining efficiency (col. 1 line 62-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the test taught by Gimaev et al. to find the optimum pulse amplitude by initially cathodically depositing a metal on a clean metal surface and use the calibration means in the pulse amplitude, frequency, and duration calibration method taught by Taylor because it would allow for higher machining efficiency.

Regarding claim 3, Taylor further teaches machining samples using unipolar (anodic) machining pulses in order to yield a range of surface conditions (rough, smooth, dull, shiny) (Zhou et al. col. 11 lines 15-20, col. 11 lines 51-65, table 1-2), and assigning various variables to the yield surface conditions (d, w, d/w, mass loss, table 1 and 2), the anodic pulse waveform (inverse polarity) having a pulse duration allows for removal of surface conditions initial surface conditions (Zhou et al. col. 13 line 49 – col. 14 line 14), and providing for a means of comparing d/w (variables) to the anodic duty cycle, which shows the relationship to anodic duty cycle time and yielded surface conditions (Zhou et al. col. 13 lines 31-49).

Regarding claim 4, Taylor teaches applying an anodic pulse waveform (shown in figure 2, unipolar) until the surface conditions of the larger asperities are reduced in height so as to be microasperities (col. 5 lines 25-59), and setting a limit of the height (operational parameter) of macroasperities to denote the end of the first machining step (col. 5 lines 31-37), the height (operational parameter) of the macroasperities is measured in micrometers preferably less than about 100 micrometers (col. 5 lines 31-37), once the macroasperities have reached the target height (first condition) a second anodic pulse waveform is applied to the workpiece until a second condition is met and a

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final surface roughness is reached with asperities less than 0.1 micrometers (second measurement) (col. 6 lines 18-37), and the pulse duration, amplitude, and frequency can be calibrated for this process (Zhou et al. example 1)

Regarding claim 5, Taylor teaches the height of macroasperities [404] and microasperities [406] is the variable that characterizes the surface condition of the electrode (col. 4 lines 40-50, figures 4A-C).

Regarding claims 6 and 9, Taylor teaches using a cathodic current/potential as a parameter as an operational parameter (Zhou et al. col. 5 lines 20-42) and discusses a Fourier transform harmonic like pulsing of the current applied to the workpiece (Zhou et al. figure 1) and using this harmonic motion as the operational parameter during machining of the workpiece (col. 5 lines 20-42).

Regarding claims 7 and 8, Taylor teaches plotting results during calibrating a machining process corresponding to the anodic duty cycle and frequency (interval between unipolar machining pulses) and using the results of the plots (slope and area under the curves) to select an optimal operational parameter during machining (Zhou et al. col. 13 lines 14-48).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff Yakulis whose telephone number is 571-272-9807. The examiner can normally be reached on M-F 9:30 AM-7:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER